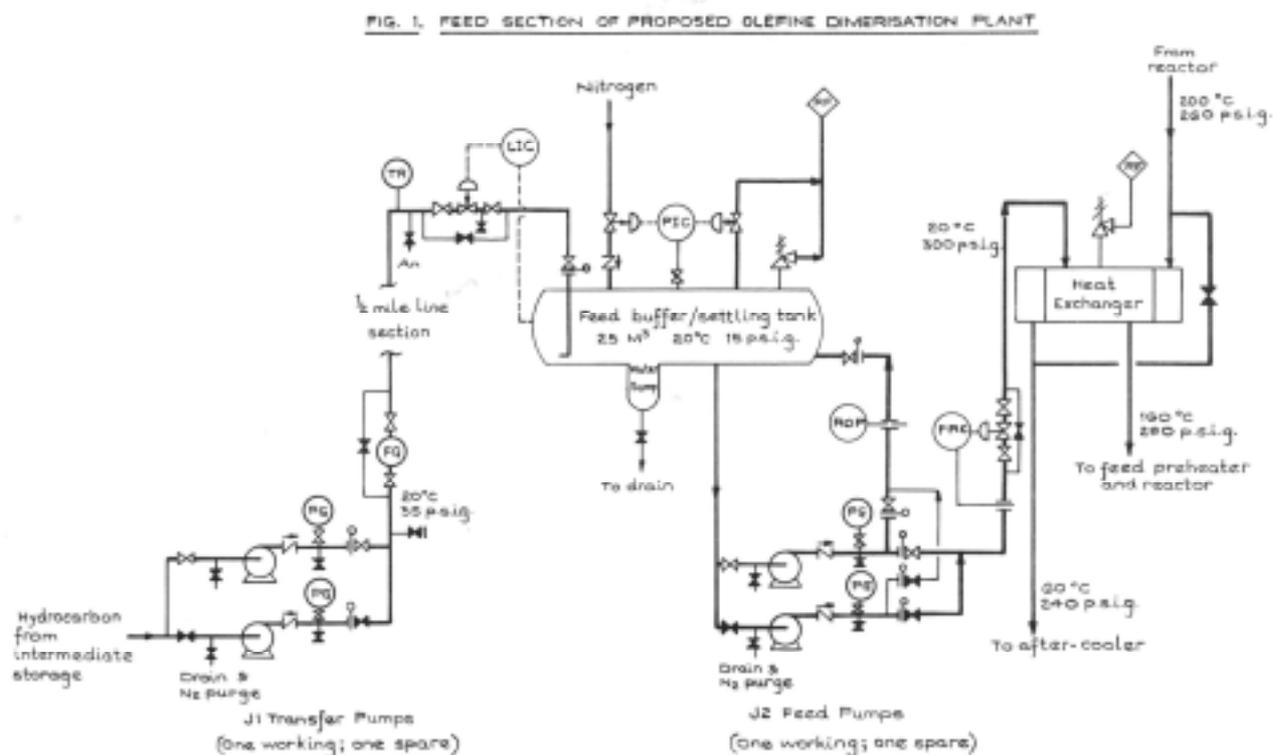


IMPERIAL CHEMICAL INDUSTRIES LIMITED PETROCHEMICALS DIVISION

SAFETY NEWSLETTER No 68

68/1 WHAT IS WRONG WITH THIS LINE DIAGRAM?

It shows the feed stage of a proposed olefine dimerisation plant



The process details are as follows.

An alkene/alkane fraction containing small amounts of suspended water is continually pumped from bulk intermediate storage via a half-mile pipeline into a buffer/settling tank where residual water is settled out. The mixture then passes via a feed/product heat exchanger and a preheater to a reactor. The water, which has an adverse effect on the dimerisation reactor, is run off manually from the settling tank at intervals. Residence time in the reactor must be held within closely defined limits to ensure adequate conversion of the alkene and to avoid excessive formation of polymer.

If you would like to know the changes we considered necessary, see the article by H.G.Lawley in "Chemical Engineering Progress", April 1974, page 45. (reprinted in "Hazop and Hazan" by T.A. Kletz, Chapter 2).

The article will also tell you how we found out what went wrong.

68/2 QUICK RELEASE FITTINGS ON PRESSURE VESSELS — THE NEED FOR INTERLOCKS OR SELF-RELIEVING DEVICES

Two fatal accidents have occurred in the Division as a result of men opening up vessels which were under pressure, without first making sure that the pressure was blown off.

The first incident occurred about ten years ago. An operator apparently forgot to open the vent valve on a pressure filter before opening the filter. As he started to release the door it flew open.

The second incident occurred earlier this year. Plastic pellets are carried in road tank wagons and are blown out with compressed air. A driver opened a man-hole cover without first making sure that there was no pressure in the wagon. The cover flew open and knocked him off the wagon.

Every day, in every works, equipment which has been under pressure is opened up but this is normally done under clearance one man prepares the job and another opens up the vessel and it is normally done by slackening bolts so that any pressure present will be detected — provided the joint is broken in the correct way.

The two fatal accidents happened under unusual circumstances — when one man did the whole job —preparation and opening up — and used a quick-release fitting instead of nuts and bolts.

Whenever this happens it is inevitable that sooner or later, through oversight or neglect, an attempt will be made to open the equipment whilst it is under pressure.

Therefore, whenever an operator has to open up equipment which has been under pressure either

(a) an interlock should be provided so that the vessel cannot be opened up until the vent valve is open or

(b) the design of the cover or lid should allow it to be raised about half an inch whilst still capable of carrying the full pressure and a separate operation should be required to release the cover fully. If the cover is released while the vessel is still under pressure, then this is immediately apparent and the pressure can blow off through the half-inch gap or the cover can be resealed.

Method (b) should always be used instead of method (a) if the vent line is liable to choke.

There are several mechanical devices which can be used to achieve (a) or (b), for example, the 'Bolt-lock' device patented by the Leeds and Bradford Boiler Company.

The Factory Inspectorate have recently issued a Technical Data Note, No. 46, 'Safety at Quick-Opening and other Doors of Autoclaves" (available free from local offices) in which they recommend interlocking or self-relieving devices to prevent a vessel being opened up before the pressure is released. This is now Division policy.

In both the fatal accidents mentioned earlier, the pressure on the vessels was about 10 psig. Many people were surprised that such a small pressure could kill someone.

10 psig is not a small pressure. You have seen the photographs of the damage at Flixborough distillation columns pushed over and buildings demolished. This damage was caused by a pressure of about 10 psig.

68/3 FLAMMABLE LIQUID IS TRAPPED BETWEEN THE PLATES OF A LAP-WELDED TANK

The roof of an old floating roof tank had to be repaired, as some of the welds were porous. The tank was steamed out and cleaned and tests showed that no flammable gas or vapour was present. A welder started work and soon after there was a flash of flame which singed his hair.

The roof was made from plates which overlapped each other by about four inches and which were welded together on the top side only — an old-fashioned method of construction that we have not used for some years.



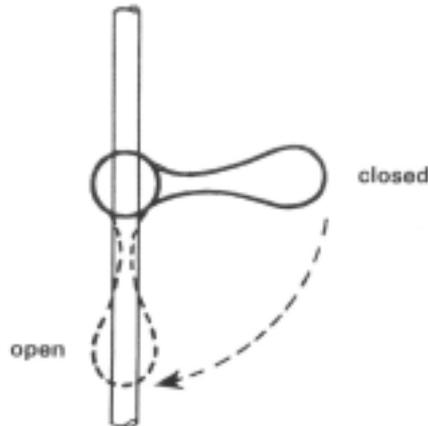
It is believed that some petrol entered the space between the plates and became trapped by rust and scale. The heat from the welding vaporised the petrol and the rise in pressure blew it out of the molten weld. If tanks made from lap-welded plates have to be repaired then they should be filled with water. The water will keep the space between the plates cool and prevent any trapped petrol vaporising.

68/4 AIR COOLER FANS SHOULD BE STOPPED IN A FIRE— DO NOT PUT THE STOP BUTTONS TOO NEAR

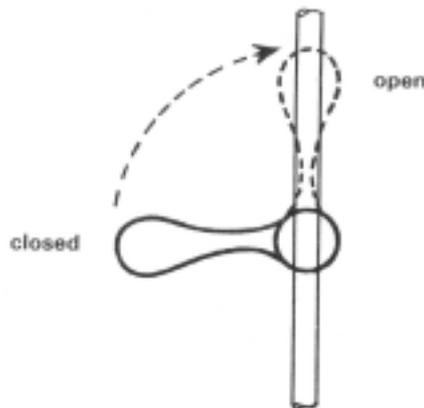
Another Company have reported that a number of fires on fin-fan air coolers have been made worse by the draught produced by the fans. The stop buttons for the fans were near the coolers and no-one could get to them to stop the fans. The Company recommend that the stop buttons should be located some way from the coolers. Alternatively, the buttons can be duplicated in a safe area.

68/5 HOW TO STOP BALL VALVES VIBRATING OPEN

Ball valves and cocks on vertical lines have often vibrated open



To prevent this happening the valves should be installed so that when they are open the valve handle points upwards.



68/6 SIX YEARS AGO

The following appeared in Safety Newsletter No. 4, September 1968

In earlier Newsletters I have mentioned several accidents that could have been prevented by the Division policy of locking shut valves which isolate equipment under maintenance and in addition isolating the equipment by slip-plates, unless the job is so quick that fitting slip-plates would take as long as the main job and be as hazardous.

A fatal accident which occurred recently in another Division brings out the same point. A liquid ammonia pump had been disconnected by maintenance and partly dismantled. The operator was about to start up a movement using the spare pump. He was found lying beside the pumps with ammonia leaking through the suction valve of the dismantled pump and out of an open end.

We do not, of course, know with certainty what happened but it is believed that the operator was trying to check that the valve on the pump was tightly closed by easing it off its seat and then tightly closing it again. The operators often do this when both pumps are connected up. It may have

become an ingrained habit with the operator concerned and he may have done it on this occasion falling to realise that if there had been any leakage the ammonia would be seen escaping from the open end. It is also possible that the operator did not appreciate the rate at which ammonia can escape from a valve that is just cracked open and the overpowering effect a small amount of liquid ammonia can have on a person.

The accident would not have occurred if the pump had been isolated by fitting slip-plates or blanks and if the valve had been locked shut while the slip-plates or blanks were being fitted.

The report on the accident, in fact, recommends that in future blank flanges should be fitted and that the man fitting them must wear breathing apparatus and must not be left alone.

68/7 SOME QUESTIONS I AM OFTEN ASKED

3- HOW CAN WE CHANGE PEOPLE'S ATTITUDE TO SAFETY?

The wrong attitude is often given as the reason for a poor accident record — 'We need a change in attitude', 'The management must adopt a different attitude', 'The British workman has the wrong attitude'.

Courses are designed to change people's attitudes. Syndicates discuss the safety record and ways of improving it. The organisers hope that those present will change their attitude and go away "committed" to do something different.

How long does this commitment last?

F Herzberg puts the opposite view: "(These courses) rest on the assumption that to change people's attitude is to change their behaviour. In truth it's the other way about. A change in behaviour leads to a change in attitude" ("Sunday Times", 31.1.71).

It is doubtful if attitude can be changed by a direct, head-on assault and it is doubtful if we have any right to try and do so. A man's attitude is his private affair — we should concern ourselves with whether or not he achieves his objectives.

If he has too many fires, let us discuss the reasons for them and what can be done to prevent them happening again. Also, perhaps, what they cost, if our man is not convinced that he need do anything. If he has too many choked vents, leaking joints, or anything else let us discuss the reasons for them and what can be done to prevent them happening again.

After a while our friend may start to do a few things differently, he may have fewer fires and accidents and people will say, "He's changed his attitude".

In brief, *Don't try to change people's attitudes*

Just help them with their problems.

68/8 UNUSUAL ACCIDENTS NO. 38

On many occasions road tank wagons have been driven away while hoses were still connected up. See, for example, Newsletter 50/2. One Company therefore made a rule that, before driving off, drivers must walk round their vehicle to make sure the hoses are disconnected.

One driver, while doing so, tripped over a hose that was still connected and injured himself.

68/9 RECENT PUBLICATION

Report No AI28,273/A, available from Division Reports Centres, shows that water spray can effectively protect electric cables against fire and should be considered as an alternative to Durasteel or concrete for future plants. An automatic fire detection system using a heat sensitive wire can be used to switch on the water.

For more information on any item in this Newsletter, ring P2846. If you do not see this Newsletter regularly and would like your own copy in future, please ask us to put your name on the circulation list.